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ABSTRACT

Two studies investigated the effect of microcomputers on children's social behavior in preschool classrooms. The first study was conducted at a university nursery school; the second took place at a university day care center. Guided by a list of behaviors selected from the Friedrich and Stein Observation Scale, observations were made at both settings during a 1-hour free-play period. Twelve social behaviors were categorized as prosocial, antisocial, or neutral. A microcomputer and age-appropriate software were introduced into each classroom according to the following schedule of treatment weeks: baseline, computer-noninteractive (omitted in the second study), computer-interactive, and computer-interactive/teacher-interactive. Except for level of antisocial behavior, results indicated few differences in social interaction patterns between the microcomputer and other free-play choice areas. Critical factors related to the level of antisocial behaviors within the microcomputer area appeared to be the ratio of children to microcomputers and the amount of structure provided by the teacher. Contrary to the predictions of some, the computer did not diminish children's social interactions. (Author/RH)

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Introducing a Microcomputer to a Preschool Classroom: The Effects on Children's Social Interaction

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Abstract

The advent of the computer is dramatically changing the fabric of American society and our educational system. The rapidity of this developing technology has thrust children into the world of microcomputers with little research about the impact of such technology on children's development. This two-study project investigated the effect of a microcomputer on children's social behavior in a preschool classroom. The first study was conducted at a university nursery school and the second study was conducted at a university day care center. At both settings, 4-year-old children were observed during a 1-hour free-play period using selected behaviors from the Friedrich and Stein Observational Scale. Twelve social behaviors were categorized around prosocial, antisocial, and neutral behaviors. A microcomputer with age-appropriate software was placed in each classroom with the following treatment weeks: baseline, computer-noninteractive (omitted in the second study), computer-interactive, and computer-interactive/teacher-interactive. Results indicated few differences in social interaction patterns between the microcomputer area and other free-play choice areas, except for antisocial behaviors. The critical factors related to the level of antisocial behaviors within the microcomputer area appeared to be the ratio of children to microcomputers and the amount of structure provided by the teacher. In conclusion, the computer did not diminish children's social interactions as some have predicted.

Introducting a Microcomputer to a Preschool Classroom: The Effects on Children's Social Interaction

Entrance into the information age is forcing dramatic change and innovations at all levels of American education. The impetus of this change is the silicon chip and its associated technologies, particularly the microcomputer. So sudden is the dawning of this new age that Kelman (1982) states, "there has been almost no time taken to reflect seriously upon pedagogical, psychological, and ethical issues involved in computer-based education." As with the introduction of any technology, recurring issues arise concerning this new medium. Wartella and Reeves (1982) have documented that the birth of mediums such as radio, movies, television and videogames have prompted repeated concerns over their effects on children's physical and psychological health. Proponents and opponents of computers have adopted two distinct postures -- the computer as messiah or monster (Shepard, 1980).

On the one hand, much of the believed threat of the computer centers on how it will affect children's social behaviors. The microcomputer is often viewed as a medium that will mesmerize children and invite social isolation. Some are concerned that children will interact only with machines, thereby decreasing interaction with other people (Heller & Martin, 1982, p. 136). If the computer diminishes social interaction, Barnes and Hill (1982) suggest deficiencies in language and other social behaviors would result. Another fear is

that computers will become a medium to accelerate development and hurry the child (Elkind, 1981).

On the other hand, new technologies such as the microcomputer are defended on the grounds of their educational benefits, both socially and cognitively (Lawler, 1982; Papert, 1982; Sheingold, 1983; Zaijka, 1983). Many researchers propose the ages of three and four as an opportune time to introduce children to computers without deleterious consequences to their social development. Contrary to popular fears, computers can foster social interaction such as verbal interaction, sharing, helping, turn-taking, and collaboration (Borgh & Dickson, 1983; Church & Wright, 1983; Hawkins, Sheingold, Gearhart, & Berger, 1982; White, 1983). Moreover, some studies have reported greater occurrences of various social interactions taking plcae around the computer when compared to other classroom activities (Jewson & Pea, 1982; White, 1983). Such findings seem to dispell the opinion that the microcomputer will promote social isolation, at least in early education.

In spite of all the rhetoric, little systematic research is available addressing the effects of the microcomputer on young children's development in early childhood education centers. As this technology becomes increasingly available to early education, it is both timely and important to investigate how its presence may effect children's social development. This study investigated the effect a microcomputer has on young children's social interaction patterns within a structured classroom. The specific questions addressed were:

What kinds of social interactions occur around the microcomputer?

Are the social interactions at the microcomputer different from the social interactions in the other free-play areas?

Do these social interactions occur at different rates in the computer area versus the other play areas?

To answer these questions, a two-study experiment was conducted in separate early childhood educational facilities.

Method

Subjects

Study 1 used the eight boys and four girls enrolled in the 4-year-old class at the University Nursery School. The children, from white, well-educated, two-parent families, ranged in age from 4 years, 2 months to 5 years (average age = 4.5 years). One male in the classroom who was diagnosed as aphasic was not included in the analyses, leaving 11 subjects.

For Study 2, the 4-year-old class of the University day care center was utilized. Again, the 12 girls and 10 boys were mostly from well-educated, two-parent families and ranged from 3 years, 11 months to 5 years, 4 months (average age = 4.7 years). Twenty of the children were white and two black. One boy and one girl who were absent during the week of baseline were not included in the analyses, leaving a total of 20 subjects.

Social Interaction Measure

Children's social behaviors were measured during a 1-hour free-play period using an adaptation of the Friedrich and Stein Observational Scale (Friedrich & Stein, 1973). Nine behaviors were selected from the Friedrich and Stein Observational Scale and three behvaiors were added for this study. The 12 behaviors were evenly divided into three major categories as follows:

A. **Pro-social Behaviors**

1. **Cooperation:** Child interacts with one or more children in such a way that behvaior is directed toward a common goal.
2. **Helping/Sharing:** Child gives or offers help or materials to other children or adults.
3. **Praise:** Gestures of physical affection (hugs, embrace); verbal praise.
4. **Initiating Social Interaction:** Child attempts to initiate social interaction with another child.

B. **Anti-Social Behaviors**

1. **Physical Aggression:** Hitting, banging, throwing, kicking, etc. another person.
2. **Verbal Aggression:** Name calling, teasing, jeering, threatening, angry talk to another; derogation.
3. **Non-verbal Aggression:** Interference with other child's activity; attempting to take something or grab something from others.

4. **Object Aggression:** Injury to objects; banging, hitting, throwing objects.

C. **Neutral Behaviors**

1. **Asking Adult for Help:** Child asks an adult for help with something.
2. **Looking at Computer:** Child looks at the computer; child diverts attention away from activity to the computer area.
3. **Verbalization Toward Adult:** Child talks to an adult or teacher.
4. **Verbalization Toward Child:** Child talks to another child.

Observations were done on a time-sampling basis with individual children being observed 5-minute periods. Within each 5-minute period, there were 15 intervals (each interval = 10-sec observe/10-sec record). In Study 1, each child was observed for three 5-minute periods per day; in Study 2, each child was observed for at least two 5-minute periods per day. Over the course of the four weeks in Study 1, each child was observed for 38-42 5-minute periods. Over the three weeks of Study 2, each child was observed for 20-25 5-minute periods.

The free-play observation hour was divided into three equal time periods: the beginning 20 minutes, the middle 20 minutes, and the last 20 minutes. Observation intervals were scheduled so that each child was observed equally in the first, middle and last 20-minute segments of the free-play period. In Study 1, subjects were observed an average of 13.8 times in the first 20 minutes, 12.9 in the middle 20 minutes,

and 12.7 in the last 20 minutes of the free-play choice hour. The figures for Study 2 were: 7.75 times in the first 20 minutes, 7.45 times in the middle 20 minutes, and 7.4 times in the last 20 minutes of the free-play hour.

Observers

Four trained observers were used in Study 1 and the same four observers plus one additional trained observer were used in Study 2. The observers were trained to a criterion reliability of .90 before Study 1 began.

Observer Reliability

Reliability checks were made 25-30% of the time for each observer. Reliability check intervals were equally distributed among the first, middle, and last 20-minute segments of the free-play period and were equally distributed across children. For Study 1, 35 reliability checks took place in the first 20 minutes of the hour; 36 occurred in the middle 20 minutes; and 34 in the last 20 minutes. Each child was included 8-11 times in a reliability check. In Study 2, there were 21 reliability checks in the first 20 minutes, 26 in the middle 20 minutes, and 24 in the last 20 minutes of the free-play period. All children but one in Study 2 were included either 3 or 4 times in a reliability check; one child was included 5 times.

Procedure

Prior to the beginning of the treatment phases, biographical data was collected and a family questionnaire was administered to assess

family computer purchases. The children in both settings were observed during a 1-hour free-play period on Tuesdays through Fridays. In Study 1, children selected activities from one of six play areas: art, block, dramatic play, entrance area, manipulative toys, and media (books). Children in Study 2 selected from five similar areas: art, concept (like manipulative toys but more math/reading concept materials), dramatic play, quiet (had tinker toys and Lincoln logs for building but no large blocks), and media (books and telephone).

The children were observed for a week of baseline followed by two (Study 2) or three (Study 1) weeks with the computer added to the media area. In Study 1, the weekly treatment phases were as follows:

1. **Baseline:** Classroom remained basically unchanged except the the floor was taped off to designate play areas and the children were given numbered vests to wear; a female observer was present in the media area, but she did not interact with the children.
2. **Computer Present/Noninteractive:** An Apple IIe with disk drive and color monitor was placed on a low table with several chairs in the media area. A Sticky Bear ABC's demo diskette caused the computer to function like a television: there was continual action on the screen and use of the keyboard had no effect on the software. The female observer did not interact with the children who came to the computer.

3. **Computer Present/Interactive:** Sticky Bear numbers and ABC's software were used. With the ABC's software, any letter-key touched operated the software; with Sticky Bear Numbers, any number-key worked the software. The space bar also worked for both software packages. The female observer did not interact with the children.
4. **Computer Present/Interactive/Teacher Interactive:** This condition was identical to phase 3 except that the female observer interacted with the children, helped them use the new software added this week (Sticky Bear Shapes and Sticky Bear Opposites), and taught the children how to change software.

Study 2 had the same design except that Week 2 (Computer Present/ Noninteractive) was omitted because during Study 1, this week provided children with a misperception about the interactive nature of the computer and led to much frustration and disappointment the following week when the computer was interactive. That is, the screen did not change as rapidly as it did during Week 2.

The trained observers recorded from an observation booth adjacent to the classroom. Each observer had a list of subjects to observe during each 5-minute period and a list of alternates (in case of absence). The observers simultaneously recorded the location of each child and all social behvaiors which occurred during the interval. Tape was placed on the floor of the classroom to assist the observers

in delineating the play areas. In addition, the children were given vests with a large number and their first name printed on the front and back. This further assisted the observers in quickly identifying and locating children. To ensure continuity of time periods for all observers, a tape recording was used which announced "observe" and "record" every 10 sec.

Results

Children selected play areas with differing rates and therefore were observed in play areas for differing amounts of time. To make data comparable across children, frequencies of social behaviors within each play area were converted into percentages for data analysis. The data for each study were analyzed by a two-way repeated measures MANOVA with play area and treatment week as the independent variables and the 12 social behaviors as dependent measures. Given a significant MANOVA, individual univariate analyses were performed. To control for experiment-wise error, alpha for the univariates was set at .01. Tukey's multiple comparisons were performed at the .01 level for all significant univariate analyses.

Study 1

A separate study conducted at the same time at the Nursery School (Lipinski, Nida, Shade, & Watson, 1984) examined the amount of time children spent in the different free-play choice areas. These data provide a referent for the representativeness of the random observations of children in free-play areas. The percentage of

intervals children were observed in each of the free-play areas in this study is almost identical to the percentage of time the children spent in each of the play areas in the Lipinski et al. report (see Table 1).

The data for each of the 12 social behaviors were converted to percentages for analysis -- i.e., the number of intervals in which each behavior occurred divided by the number of intervals the child was observed in that free-play area. Mean percentages for each behavior in each free-play area are presented in Table 2.

The two-way (area x treatment week) repeated measures MANOVA yielded a significant overall area x treatment week interaction [Wilk's lambda = .125, $F(180,1307) = 1.47$, $p < .0001$] and a significant overall main effect [Wilk's lambda = .022, $F(60,186) = 3.88$, $p < .0001$]. The overall main effect for treatment week approached significance [Wilk's lambda = .093, $F(36,57) = 1.95$, $p < .02$]. Given these significant MANOVA results, the univariate analyses for each of the 12 behaviors (summarized in Table 3) are presented separately.

Cooperation

The univariate analysis for cooperation revealed a significant main effect for area [$F(5,50) = 9.46$, $p < .0001$]. Tukey's multiple comparison procedure (alpha = .01) showed that the block and dramatic play areas had significantly more occurrences of cooperation than all other play areas. These two areas were not significantly different from each other and there were no other significant differences among play areas.

Helping

Helping behavior was a low frequency behavior in all play areas with the means for helping behavior within the play areas ranging from .2% to 3.3%. There was no significant interaction nor any significant main effects present in the univariate analysis for helping, that is, there were no differences among play areas with regard to helping.

Praise

Praise was an extremely low frequency behavior; means for the six play areas ranged from 0 to .3%. Again, there were no significant differences among play areas for this behavior. The univariate analysis revealed no main effects and no interaction.

Initiating Social Interaction

Two significant main effects were found in the univariate analysis for initiating social interaction: main effect for area [$F(5,50) = 4.88$, $p < .001$]; main effect for week [$F(3,30) = 10.14$, $p < .001$]. Tukey's multiple comparison procedure (alpha = .01) was used for both main effects and revealed that more initiation of social interaction occurred in baseline than in the other three treatment weeks and the dramatic play area had significantly more initiation of social interaction than the art and computer areas.

Anti-Social Behaviors

The univariate analyses for the four anti-social behaviors -- physical, verbal, non-verbal, and object aggression -- revealed no

interaction and no main effects. All four behaviors occurred at a low, mean frequency (all below 1%) in all play areas of the classroom.

Asking Adult for Help

Seeking help from adults was another low frequency behavior across all play areas (means ranged from .3% to 1.8%). No main effects nor interactions were found.

Looking at Computer

Designed as a measure of distraction (that is, time spent looking at the computer while in other play areas), this behavior yielded a significant interaction [$F(15,147) = 3.97$, $p < .0001$], a significant main effect for area [$F(5,50) = 6.44$, $p < .0001$], and a significant main effect for treatment week [$F(3,30) = 5.53$, $p < .01$].

All of these effects were directly related to the computer area. Looking at the computer rarely occurred in any of the other play areas, never more than .4%. In the computer area, there obviously was no looking at the computer during baseline but during weeks 2, 3, and 4, children spent 33-36% of their time in the computer area looking at the computer.

Verbalization Toward Adult

The univariate analysis for this behavior yielded a significant area effect [$F(5,50) = 6.44$, $p < .0001$]. According to Tukey's multiple comparison procedure (alpha = .01), there was significantly more verbalizing to adults in the art area than in any other area except toys. The toy area did not differ significantly from any other play area. No other significant differences were found.

Verbalization Toward Child

Both a significant area x treatment week interaction [$F(15,147) = 2.20$, $p < .01$], and a significant area main effect [$F(5,50) = 4.56$, $p < .01$] were revealed in the univariate analysis for verbalizations to other children. From baseline to Week 2, child-child verbalizations dramatically increased in the block area (8% to 22%), the dramatic play are (13% to 24%), the toy area (4% to 11%), and the computer area (0 to 24%). These verbalizations decreased in the entrance area (12% to 0) and remained about the same in the art area (7% to 5%). During Week 3, child-child verbalizations decreased in the block (22% to 17%), dramatic play (24% to 18%), and computer areas (24% to 10%). Art and toys did not change from Week 2 to Week 3 and the child-child verbalizations in the entrance area returned to baseline levels. From Week 3 to Week 4, all play areas basically remained the same except for the entrance area which again dipped well below the previous week (13% to 2%). Tukey's multiple comparison procedure (alpha = .01) on the area main effect revealed that overall the dramatic play area had significantly more child-child verbalizations than either the art or entrance areas. There were no other significant differences among play areas.

Study 2

A separate study conducted at the same time at the day care center examined the amount of time children spent in the different free-play choice areas (Lipinski et al., 1984). As for Study 1, these data provide a referent for the representativeness of the random

observations of children in play areas. The percentage of intervals children were observed in each free-play area in this study is almost identical to the percentage of time the children spent in each of the free-play areas in the Lipinski et al. study (see Table 4). Mean percentages for each behavior by free-play area are presented in Table 5.

The two-way (area x treatment week) repeated measures MANOVA yielded a significant area x treatment week interaction [Wilk's lambda = .2774, $F(96,960) = 2.10$, $p < .0001$] and a significant overall area effect [Wilk's lambda = .1358, $F(48,252) = 3.57$, $p < .0001$]. The overall treatment week effect approached significant [Wilk's lambda = .2077, $F(24,54) = 2.69$, $p < .02$]. Given these significant MANOVA results, the univariate analyses for each of the 12 behaviors (summarized in Table 6) will be presented separately.

Cooperation

The univariate analysis for cooperation revealed a significant interaction [$F(8,152) = 2.72$, $p < .01$] and a significant main effect for area [$F(4,76) = 9.19$, $p < .0001$]. Across the three weeks of the study, cooperation decreased for the art area, increased for dramatic play and concept areas, and remained the same for the quiet area. Within the computer area, cooperation increased from baseline to Week 2 (0 to 16%) and then decreased in Week 3 to 4%. A Tukey's multiple comparison procedure (alpha = .01) on the area main effect showed dramatic play having significantly more cooperative behavior than the computer or art areas. There were no other significant differences.

Helping

Helping behavior occurred at a low rate throughout the study (means ranged from .2% to 1.3% for the various play areas). There were no significant effects in the univariate analysis.

Praise

This behavior occurred with extremely low frequency (means for play areas ranged from 0 to .4%). No significant effects were found.

Initiating Social Interaction

A significant treatment week effect [$F(2,38) = 5.30$, $p < .01$] occurred in the univariate analysis for initiating social interaction. Tukey's multiple comparison procedure (alphs = .01) revealed more initiation of social interaction during baseline than Week 3.

Physical Aggression

There was a significant interaction [$F(8,152) = 6.05$, $p < .0001$] and a significant main effect for area [$F(4,76) = 4.11$, $p < .01$] for the behavior of physical aggression. These effects were related to the computer area. During Week 2, physical aggression increased in the computer area (from 0 to 3%) and then decreased in Week 3 with the interaction of the teacher (to .2%). All other areas remained stable on this measure.

Verbal Aggression

As with physical aggression, an interaction effect [$F(8,152) = 3.91$, $p < .001$] was apparent with verbal aggression. All play areas remained at a low, stable rate except for the computer area which went from a baseline of 0 to 2% in Week 2 and back to 0 in Week 3.

Non-verbal Aggression

The same pattern as noted for the two previous behaviors was present with non-verbal aggression. The significant interaction [$F(8,152) = 3.64$, $p < .001$] and significant area effects [$F(4,76) = 4.90$, $p < .01$] were a result of the computer area's increase from 0 in baseline to 4% in Week 2 and back to .7% in Week 3.

Object Aggression

Object aggression occurred with low frequency in all play areas (ranged from 0 to .3%). There were no significant effects in the univariate analysis.

Asking Adult for Help

No significant interaction nor main effects were found in the univariate analysis for seeking help from adults.

Looking at Computer

As in Study 1, there were both significant main effects [Area: $F(4,76) = 20.67$, $p < .0001$; Week: $F(2,38) = 8.11$, $p < .01$] and an interaction effect [$F(8,152) = 7.45$, $p < .0001$] for looking at the computer. Again, all these effects were related to the computer area. Children were rarely observed looking at the computer while in other play areas.

Verbalization Toward Adult

There were no significant effects in the univariate analysis of child-adult verbalizations.

Verbalization Toward Child

A significant main effect for area [$F(4,76) = 7.90$, $p < .0001$] was apparent in the child-child verbalization univariate analysis. Tukey's multiple comparison procedure was employed (alpha = .01) and revealed significantly more child-child talk in the dramatic play area than the art area. There were no other significant differences among areas.

Discussion

These findings are consistent with the research literature suggesting that the microcomputer will not lead to social isolation or have deleterious consequences on young children's social develoment (Borgh & Dickson, 1983; Church & Wright, 1983). At the same time, the findings do not support the research claims that more social interactions occur around the computer than any other classroom activity (Jewson & Pea, 1982; White, 1983). Unlike these anecdotal findings, the systematic nature of this study provided an objective account of young children's social behaviors in a preschool classroom.

An examination of the results indicates a consistency with what one would expect of preschooler's behaviors within various play areas. For example, one would expect more cooperative play among children in the block and dramatic play areas, which was found. Conversely, less cooperation would be expected in the art area where children are more likely to be focusing on individual work. Again, this was found to be true. Likewise, this study found more verbalizations between children

in dramatic play as compared to art. Lastly, one would expect low frequencies of certain behaviors such as helping and praise among preschoolers; the findings again match this expectation.

More importantly, the results from the two studies reveal striking consistencies. This was so despite the fact that two different types of early education centers were involved. First, the prosocial behaviors were quite similar. Cooperation occurred more frequently in the block and dramatic play areas in Study 1 and also occurred more frequencly in dramatic play in Study 2 (there was no block play area in this classroom). Secondly, helping and praise were low frequency behaviors in both studies. Thirdly, initiating social interaction occurred more during the baseline weeks in both cases. Additionally, this behavior occurred with about the same frequency throughout the play areas with one exception. In Study 1, initiating social interaction occurred more in dramatic play than in art, but not more than any other play areas. Finally, an approximate replication was found among neutral behaviors. In both Study 1 and 2, more verbalizations between children were found in dramatic play than in art, but no differences were found between the other play areas. In Study 1, more child-adult verbalizations occurred in the art area than in the toy area. These same results approached significance in Study 2. In both studies, no differences were found among play areas for children asking help from adults and when children were in other play areas, they were not distracted by the computer.

While the results for positive and neutral behaviors were similar for both studies, the antisocial behaviors were not. Study 1 yielded no significant differences among the various play areas on the four anti-social behaviors; all these behaviors were very low frequency. By contrast, Study 2 revealed area x treatment week interactions for physical, verbal, and non-verbal aggression. During Week 2, there was an increase in all these aggressive behaviors in the computer area; these behaviors decreased in the computer area by Week 3. It should be noted that while significant differences were found, these behaviors were still occurring at low rates. This effect may be attributable to differences in the number of children present in the two classrooms. In Study 2, 22 children as compared to 12 children in Study 1 were competing for one computer. In Study 2, more children crowded around the computer, vying for a turn. Most importantly, during Week 2, while the teacher remained non-interactive the computer area was unstructured. Once the teacher became an active participatn and assisted the children at the computer, thereby adding structure, these aggressive behaviors disappeared. Moreover, the children in Study 1 added structure by developing their own rule about computer use: "only two at a time."

Two avenues seem implicated at this point: the ratio of children to computers and the critical role of teacher structure. First, it appears that 10 children to 1 computer, as compared to 20 to 1, is a ratio that will allow children appropriate access to this educational activity. Secondly, as is the case with any preschool activity, the role of the teacher is crucial. This study found the role of the

to be the central ingredient in making the computer an effective part of the classroom. Not only does she provide structure in the activity, but helps to facilitate learning, turn-taking and control around the computer. In Study 2, more aggression occurred at the computer during Week 2 than the other play activities. However, there was a decline in this behavior when the teacher intervened in the last week of the study. In short, the teacher made the difference at the computer.

The initial task of this study was to determine whether the occurrences of social behaviors at the computer were any different than for other play areas. For the most part, just as many social behaviors occurred around the computer as in other free-play activities. Moreover, the research findings address issues for both opponents and proponents of this new technology. First, those with reservations should take note that in terms of social behavior, the microcomputer area was quite similar to other play areas in the preschool classroom. Furthermore, rarely was a child observed at the computer alone. Children were frequencly observed working in groups of two's and three's, collaborating with one another. Barnes and Hill (1983), outspoken critics of early child computer interaction, proposed that microcomputers lead to deficiencies in linguistic development and social skills. They draw attention to the social benefits children derive from art and manipulative toys. Yet, the studies reported here clearly indicated that no more talking and other positive social behaviors occurred in the art or manipulative toy/concept areas than at the computer.

While computers need not be received with extreme caution, neither should they be fervently received as a panacea for young children's development. Rather, this new technology should be viewed as one of many learning experiences which may benefit a child socially.

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Table 1

Comparison of Percentage of Observation Intervals and Actual Percentage of Time Spent for Each of the Free-Play Choice Areas in Study 1

Free-Play Area	% Observation Intervals[1]	% Time Spent[2]
Art	15.1%	15.7%
Block	22.9%	23.1%
Dramatic Play	21.9%	21.6%
Entrance	2.4%	1.8%
Toys	23.8%	22.9%
Computer	13.9%	14.9%

[1]Percentage of the 6,065 10-sec observation intervals.

[2]Actual percentage of time children spent in each free-play choice area across the four weeks, as reported in Nida and Lipinski (1984).

Table 2

Mean Percent of Time Behaviors Occurred Within Each Free-Play Area for Study 1

Behaviors	Free-Play Area						Overall
	Art	Block	Drama	Entr.	Toys	Comp.	
Cooperation	.2%	12.1%	11.1%	1.9%	2.4%	3.2%	5.1%
Helping	1.8%	1.6%	1.6%	2.4%	3.3%	.2%	1.8%
Praise	.3%	.0%	.2%	*	*	.1%	.1%
Initiating Social Interaction	1.7%	3.2%	4.3%	2.0%	2.0%	.4%	2.1%
Physical Aggression	.1%	.2%	.2%	*	.4%	.2%	.2%
Verbal Aggression	*	.2%	*	*	*	*	.0%
Non-Verbal Aggression	.2%	.3%	.7%	*	.2%	.5%	.3%
Object Aggression	.4%	.5%	.5%	*	.5%	*	.3%
Ask Adult for Help	1.2%	.5%	1.8%	.8%	1.5%	.3%	1.0%
Looking at Computer	.1%	.1%	.0%	*	.1%	26.0%	4.4%
Verbalization-Adult	18.3%	4.0%	7.2%	7.9%	9.2%	4.0%	8.5%
Verbalization-Child	5.9%	15.3%	17.6%	6.5%	10.8%	10.8%	11.3%

* Behavior did not occur

Table 3

Summary of Univariate Analyses for Study 1

Behaviors	Effects		
	Area (df = 5,50) F	Week (df = 3,30) F	Area*Week (df = 15,147) F
Cooper tion	9.46 ***	2.36	1.97
Helping	.46	1.17	1.10
Praise	.75	1.93	.68
Initiating Social Interaction	4.88 **	10.14 ***	1.29
Physical Aggression	1.47	.14	1.06
Verbal Aggression	1.94	1.43	1.42
Object Aggression	.75	.74	1.23
Ask Adult for Help	.88	1.13	.80
Looking at Computer	46.42 ***	5.53 *	3.97 ***
Verbalization-Adult	6.44 ***	.51	1.98
Verbalization-Child	4.56 *	3.13	2.20 *
Non-Verbal Aggression	1.41	.19	1.09

* $p < .01$
** $p < .001$
*** $P < .0001$

Table 4

Comparison of Percentage of Observation Intervals and Actual Percentage of Time Spent for Each of the Free-Play Choice Areas in Study 2

Free-Play Area	% Observation Intervals[1]	% Time Spent[2]
Art	12.5%	16.8%
Concept	18.0%	16.2%
Dramatic Play	32.5%	29.8%
Quiet	20.4%	20.3%
Computer	16.5%	16.8%

[1]Percentage of the 6,291 10-sec observation intervals.

[2]Actual percentages of time children spent in each free-play choice area across the three weeks, as reported in Nida and Lipinski (1984).

Table 5

Mean Percent of Time Behaviors Occurred Within Each Free-Play Area for Study 2

Behaviors	Free-Play Area					Overall
	Art	Concept	Drama	Quiet	Computer	
Cooperation	1.9%	13.1%	22.1%	11.4%	6.8%	11.1%
Helping	1.2%	.7%	1.3%	*	.2%	.7%
Praise	*	.4%	.2%	.1%	.2%	.2%
Initiating Social Interaction	2.4%	1.5%	1.6%	2.2%	.9%	1.7%
Physical Aggression	.1%	.2%	.5%	.2%	1.1%	.4%
Verbal Aggression	*	.2%	.3%	*	.5%	.2%
Non-Verbal Aggression	*	1.2%	.2%	.1%	1.7%	.6%
Object Aggression	*	.1%	.3%	.0%	.0%	.1%
Ask Adult for Help	2.5%	2.5%	1.5%	.4%	.2%	1.4%
Looking at Computer	.2%	.3%	.0%	*	12.5%	2.6%
Verbalization-Adult	14.3%	6.8%	15.8%	8.3%	5.8%	10.2%
Verbalization-Child	5.1%	19.8%	13.1%	12.1%	13.1%	12.6%

* Behavior did not occur

Table 6

Summary of Univariate Analyses for Study 2

Behaviors	Effects		
	Area (df = 5,50) F	Week (df = 3,30) F	Area*Week (df = 15,147) F
Cooperation	9.46 ***	2.36	1.97
Helping	.46	1.17	1.10
Praise	.75	1.93	.68
Initiating Social Interaction	4.88 **	10.14 ***	1.29
Physical Aggression	1.47	.14	1.06
Verbal Aggression	1.94	1.43	1.42
Non-Verbal Aggression	1.41	.19	1.09
Object Aggression	.75	.74	1.23
Ask Adult for Help	.88	1.13	.80
Looking at Computer	46.42 ***	5.53 *	3.97 ***
Verbalization-Adult	6.44 ***	.51	1.98
Verbalization-Child	4.56 *	3.13	2.20 *

* $p < .01$
** $p < .001$
*** $p < .0001$